United Nations E/CN.17/2008/7

Economic and Social Council

Distr.: General
8 February 2008

Original: English

Commission on Sustainable Development
Sixteenth session
5-16 May 2008
Item 3 of the provisional agenda*
Thematic cluster for the implementation cycle 2008-2009 — review session

Review of implementation of Agenda 21 and the Johannesburg Plan of Implementation: desertification

Report of the Secretary-General

Summary

Desertification is a global issue, with serious implications for worldwide eco-safety, poverty eradication, socio-economic stability and sustainable development. Measured by indicators of human well-being and development, including gross national product per capita, access to clean drinking water and adequate sanitation, and infant mortality, dryland people — about 90 per cent of whom live in developing countries — lag far behind the rest of the world. Poor people living in dryland areas have to contend with multiple challenges of income loss, food insecurity, weakening health, insecure land tenure systems and access rights to natural resources, and lack of access to markets. Poor livelihood opportunities often force them to migrate to areas not affected by desertification in the search for a better life. The increased frequency and severity of droughts resulting from projected climate change is likely to further exacerbate desertification. In this regard, the United Nations Convention to Combat Desertification offers a platform for adaptation, mitigation and resilience.

* E/CN.17/2008/1.

08-23548 (E) 040308

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I. Introduction

1. The present report reviews the state of implementation of the goals related to the thematic area of desertification, as contained in Agenda 21, the Programme for the Further Implementation of Agenda 21 and the Johannesburg Plan of Implementation. The report should be read in conjunction with the reports on drought, agriculture, land, rural development and Africa, which are also before the Commission on Sustainable Development at its current session.

2. The report draws on substantive contributions from United Nations agencies, in particular, the Food and Agriculture Organization of the United Nations (FAO) and on regional assessments prepared by the United Nations regional commissions, in particular, the 2007 Africa Review Report on Drought and Desertification of the Economic Commission for Africa (ECA). The report also benefited, in particular, from documentation of the United Nations Convention to Combat Desertification, *Global Environment Outlook: Environment for Development (GEO 4), 2007*, a report of the United Nations Environment Programme (UNEP) and the 2005 *Desertification Synthesis* report of the Millennium Ecosystem Assessment, as well as from country and national assessments submitted by Governments and inputs from major groups.

II. Review of implementation

3. Desertification is dealt with in chapter 12, "Managing fragile ecosystems: combating desertification and drought", of Agenda 21 and under chapter IV, "Protecting and managing the natural resource base of economic and social development", of the Johannesburg Plan of Implementation. Both chapters address desertification in the context of sustainable development, recognizing that desertification is not just a change of ecosystems, but has far-reaching social and economic implications. The goals on desertification, as contained in Agenda 21 and the Johannesburg Plan, clearly underscore the interlinkages between desertification and the other thematic issues under consideration by the current session of the Commission on Sustainable Development.

A. Facts and figures on desertification

4. Desertification is defined by the United Nations Convention to Combat Desertification as land degradation in drylands resulting from various factors, including climate variations and human activities. According to the GEO 4 report, some 2 billion people depend on ecosystems in dryland areas, 90 per cent of whom live in developing countries. Worldwide, more than 30 per cent of the total land area is dryland. About 30 per cent of drylands are degraded, with particular susceptibility to desertification. Globally, 20,000 to 50,000 square kilometres are lost annually through land degradation, chiefly soil erosion, caused by unsustainable land management practices and climate change, with losses two to six times higher in Africa, Latin America and Asia than in North America and Europe.[1]

[1] United Nations Environment Programme, *Global Environment Outlook: Environment for Development (GEO 4)*, Valletta, 2007, pp. 83 and 95.

5. Continued deforestation and forest degradation has aggravated land degradation, reduced water availability and accelerated loss of vegetation. Inefficient water use in irrigated agriculture has increased pressure on freshwater bodies and groundwater resources in dryland areas. Unchecked falls in water tables and increased salinity have reduced water availability and water quality, with far-reaching implications for human health, land productivity, agricultural and animal husbandry development, and biodiversity.

6. Across Africa, drylands vulnerable to, or affected by, desertification occupy about 43 per cent of the region. The most common processes of land degradation eventually leading to desertification are soil erosion, soil nutrient depletion, contamination of soils and salinization. The biggest impact of land degradation is on agriculture, which is the dominant land use in Africa and the biggest employer.[2] Two thirds of arable land is expected to be lost in Africa by 2025 and land degradation currently leads to the loss of an average of more than 3 per cent of agriculture gross domestic product annually in sub-Saharan Africa. If land degradation continues at the current pace, it is projected that more than half of the cultivated agricultural area in Africa could be unusable by the year 2050 and the region may be able to feed just 25 per cent of its population by 2025.[3]

7. In terms of the number of people affected by desertification and drought, Asia is the most severely affected continent. Desertification is manifested in many forms across the region. Degraded areas are found in most countries, with prominent examples including China, India, the Islamic Republic of Iran, Mongolia and Pakistan, the steeply eroded mountain slopes of Nepal and the deforested and overgrazed highlands of the Lao People's Democratic Republic.[4]

8. Roughly 65 per cent of West Asia's land base is drylands prone to land degradation and desertification. Soil erosion and salinization of soils constitute the major threats to land degradation and desertification in West Asia, with as much as 1.5 million square kilometres — one third of the region — affected. In extreme cases, mobile dunes encroach upon farmland and settlements. Frequently affected by drought, West Asia is one of the most water-stressed regions in the world.

9. Indonesia and Cambodia are among the countries of South-East Asia that have experienced severe land degradation. In Cambodia, approximately 50 per cent of all cultivated land is estimated to be exposed to soil erosion, leading to severe loss in soil fertility. In Indonesia, about 2.4 million hectares, accounting for roughly 35 per cent of the total land area, is degraded, while about 1 million hectares, accounting for roughly 15 per cent of the total land area, is classified as being extremely degraded.[5]

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[2] Ibid., p. 205.

[3] Economic Commission for Africa, Follow-up of the Implementation of the Outcomes of the World Summit on Sustainable Development (WSSD), Addis Ababa, November 2007, p. 117.

[4] Economic and Social Commission for Asia and the Pacific, Report of the Regional Implementation Meeting for Asia and the Pacific for the Sixteenth Session of the Commission on Sustainable Development, Jakarta, 26-27 November 2007, annex, para. 3.

[5] Yang Youlin and Lu Qui, "Challenges and Priority Areas to Implement the United Nations Convention to Combat Desertification in South-East Asian Countries". Asia Regional Coordination Unit of the UNCCD secretariat/Economic and Social Commission for Asia and the Pacific/China National Research and Development Centre for Combating Desertification, Chinese Academy of Forestry, p. 7.

10. In East Asia, China is experiencing severe desertification over a vast area. According to the 2006 China National Report on the Implementation of the United Nations Convention to Combat Desertification and National Action Programme to Combat Desertification, the area of desertification accounts for about 28 per cent of the total territory, while the area prone to desertification is estimated to account for roughly 35 per cent of the country's territory.[6]

11. In Central Asian countries, more than half of the land is highly susceptible to desertification and land degradation, and is already highly affected. Given that the majority of the Central Asian population lives in rural areas, the impact of land degradation is taking a high toll on the quality of life.[7]

12. In Latin America and the Caribbean, rising levels of land degradation and desertification affect large areas of the region and threaten food security.[8] Desertification is estimated to affect some 25 per cent of the territory, mainly caused by deforestation, overgrazing and soil erosion. Salinization of agricultural soils owing to irrigation is particularly significant in countries such as Argentina, Cuba, Mexico and Peru, which have extensive dryland areas.[9]

13. The effects of desertification extend beyond the affected dryland areas. Reduction of vegetation cover, for example, increases the formation of aerosols and dust. This, in turn, affects cloud formation and rainfall patterns, the global carbon cycle and plant and animal biodiversity.[10] Combating land degradation and desertification has implications for addressing critical issues of global interest, such as migration, conflict prevention, natural disasters and climate change.

14. Desertification affects global climate change through soil and vegetation losses. Dryland soils contain over a quarter of all of the organic carbon stores in the world and nearly all the inorganic carbon. Unimpeded desertification may release a major fraction of this carbon to the global atmosphere, with significant feedback consequences for the global climate system. It is estimated that 300 million tons of carbon are lost to the atmosphere from drylands as a result of desertification each year (about 4 per cent of the total global emissions from all sources combined).[11]

15. Climate change may adversely affect biodiversity and exacerbate desertification risks in many areas owing to the increase in evapotranspiration and a likely decrease in rainfall in drylands. However, since carbon dioxide is also a major resource for plant productivity, water-use efficiency will significantly improve for some dryland species that can favourably respond to increasing carbon dioxide and temperatures.[12]

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[6] China National Committee for the Implementation of the UNCCD (CCICCD), China National Report on the Implementation of the United Nations Convention to Combat Desertification, Beijing, June 2006, p. 5.

[7] ECE/AC.25/2008/3, para. 51.

[8] Economic Commission for Latin America and the Caribbean, Regional Implementation Forum on Sustainable Development. Santiago, 28-29 November 2007.

[9] United Nations Environment Programme, *Global Environment Outlook: Environment for Development (GEO 4)*, Valletta, 2007, p. 247.

[10] *Ecosystems and Human Well-Being: Desertification Synthesis*. Millennium Ecosystem Assessment, 2005, World Resources Institute, Washington, D.C., p. 8.

[11] Ibid., p. 18.

[12] Ibid.

B. Land use and livelihoods

16. The correlation between land use, land productivity and livelihoods is particularly evident in the world's drylands. Land degradation resulting from both natural causes and unsustainable land use practices is felt more quickly and severely in regions with poor quality land, which is characterized by salinity, erosion and nutrient depletion. The table below highlights the links between desertification, environmental impact and human well-being.

Table 1
Links between desertification, environmental impact and human well-being

Change in land	*Environmental impact*	*Material needs*	*Human health*	*Safety*	*Socio-economic*
Desertification	Loss of habitat and biodiversity Reduced groundwater recharge, water quality and soil fertility Increased soil erosion, dust storms and sand encroachment	Diminished farm and rangeland production Loss of biodiversity Water scarcity	Malnutrition and hunger Water-borne diseases, respiratory problems	Conflict over land and water resources Dust hazards	Poverty, marginalization, decreased social and economic resilience, migration

Source: United Nations Environment Programme, *Global Environmental Outlook: Environment for Development (GEO 4)*, Valletta, 2007, p. 120, table 3.3 (extract).

17. Population growth and increased food demands are driving the trend towards sedentary agriculture and farming in drylands, leading to growing tensions between the two main land uses: pastoral rangeland and cultivated land use.

18. In addressing this issue, the aforementioned *Desertification Synthesis* report found that, in some areas, intercultural conflicts and desertification have increased as herders and farmers claim access to and use of the same land; in other areas, Government policies and favourable market opportunities have resulted in increased integration of pastoral and agricultural land uses, thus providing an environmentally sustainable way to avoid desertification.

19. The intensification and expansion of agricultural activities have caused significant reduction in dryland ecosystem resilience, rendering many of them increasingly vulnerable to land degradation and desertification. Conservation agriculture to sustain and enhance agricultural production through the integrated management of locally available soil, water and biological resources, combined with cost-effective use of external inputs, has been widely adopted by small- to large-

scale farmers in drylands of Latin America, North America, Australia and Central Asia, and is expanding in parts of Africa.

20. More recently, there has been a shift from soil fertility management towards a more holistic approach that considers soil fertility management in the broader context of natural resource management. The shift takes account of an important lesson that farmers have learned, namely, that effective decisions on soil fertility are not merely driven by soil and climatic factors but also by the full range of driving factors and consequences of soil degradation — biological, chemical, physical, social, economic, health, nutritional and political.

21. While rangelands have proven to be resilient under traditional mobile grazing practices in response to seasonal changes, reduced mobility, owing to the extension of cultivated land, has led to increased pressure on remaining rangelands, contributing to their degradation.[13] New grazing strategies are being practiced in order to improve range productivity and quality. An example is provided in box I.

Box I
Thuo-Boswa Land Care Cattle Project

Owing to uncontrolled grazing, the rangelands around the Thuo-Boswa village in South Africa became degraded, rendering cattle farming unprofitable and unsustainable. With technical and financial support from the provincial government, farmers established a livestock grazing management system with fenced paddocks and reticulated water systems. As a result of the project, the calving percentage increased from less than 50 per cent to more than 80 per cent. Climax grasses have increased in abundance in the grazing paddocks and the overall status of the grazing resources has reportedly improved since the initiation of the project.[14]

22. Integrated crop-livestock farming systems have been developed in the Sahel region using community-based approaches, which has resulted in the improved cycling of nutrients between rangelands and crop land, and between ruminant livestock and the soils.

1. Soil and water conservation

23. Soil and water conservation has been implemented mostly at the community level, drawing upon the wealth of knowledge and experience that has been accumulated in local communities in their interaction with nature over time. Government interventions were supportive in policy areas where they acted as incentives to community investments in soil and water conservation. Some examples of soil and water conservation at the country level are provided in box II.

[13] Ibid., p. 6.

[14] Africa Review Report on Drought and Desertification (main report). Economic Commission for Africa, July 2007, p. 26 (ECA/FSSD/ACSD-5/3).

Box II
Soil and water conservation: some country examples

Farmers in Burkina Faso rescued their fields from imminent desertification by erecting low stone walls along the contours of hillsides to keep soil and water on the land.

Support provided to small farmers in Cape Verde has led to the introduction of new irrigation technologies and improvements in fodder recovery and seed launches in pastoral farming areas. Moreover, maize cultivation on slopes in high-altitude areas, which causes severe land degradation, is gradually being replaced by higher-yield horticulture crops, which are grown using techniques that cause less soil erosion.

In India, the introduction of soil conservation technologies and techniques, such as timeliness and precision in sowing crops, contour farming and use of low-to-moderate levels of inputs with improved seeds, has helped to improve the use of natural soil fertility and available moisture, contributing to crop growth. The introduction of a legume component in the cropping system has provided much-needed nitrogen.

Source: *Implementing the United Nations Convention to Combat Desertification in Africa: Ten African Experiences*, United Nations Convention to Combat Desertification, Bonn, Germany, 2006, p. 32; Jagarlapudi Venkateswarlu, Sustainable Agricultural Systems for the Development of Arid and Semi-Arid Areas in India. In: Advanced Technology Assessment System, issue No. 7, United Nations, New York, 1992, pp. 139-142.

24. A research study carried out by the United Kingdom Department for International Development-sponsored Agricultural Research and Extension Network on soil and water conservation in semi-arid areas of sub-Saharan Africa, which based its analysis on case studies from Burkina Faso, Senegal, Ghana, Nigeria, Uganda and the United Republic of Tanzania, found that decisions to invest in soil and water conservation are, in some cases, driven by policies and institutional structures that are beyond the immediate control of households; in other cases, they appear to depend heavily on endogenous social, cultural and agro-ecological conditions which are not easily influenced by external interventions.[15]

25. The case studies found that more than 50 per cent of surveyed farmers who had not invested in soil and water conservation attributed their decisions primarily to weak and inefficient extension services, lack of access to fertilizers, tools and seeds, and lack of access to financial capital as well as to markets where farmers can sell their produce at competitive prices.[16]

[15] Charlotte Boyd and Cathryn Turton (ed.), The Contribution of Soil and Water Conservation to Sustainable Livelihoods in Semi-Arid Areas of Sub-Saharan Africa. Agricultural Research & Extension Network (AgREN), Network Paper No. 102, London, January 2000, p. 1.

[16] Ibid., p. i (abstract).

2. Tenure security and access to markets

26. Tenure insecurity and unclear access rights to water and other natural resources are among the main reasons for the unwillingness of land users to invest in sustainable land management. In Uganda, for example, insecurity of land tenure in parts of the cattle corridor under communal land ownership systems does not encourage farmers to invest in sustainable land management practices, as noted in the 2007 Africa Review Report on Drought and Desertification.[17] Case studies from Burkina Faso, the Niger and Senegal reported by FAO suggest that without secure land rights, farmers have little or no access to credit, rural organizations and other agricultural inputs and services. In Jordan, on the other hand, the allocation of tribal land to individual Bedouins increased property values and provided the incentive to harvest water.

27. According to the GEO 4 report, more attention is now being given in Africa to the inclusion of customary tenure in national land administration laws to protect people's customary land rights. Innovative tools to both improve tenure security for the poor and to address land degradation problems include occupancy licences, customary leases and certificates. However, such tools also present problems. For example, in Zambia, registration of customary land often leads to denial of other customary rights, while in Uganda, the pace of issuing certificates has been slow, with no certificates issued since 1998.[18]

28. Some countries in West Africa have developed Pastoral Codes — framework laws which enable pastoral communities to establish jurisdiction over home territories, obtain freedom of movement in cattle corridors and negotiate access to more extensive grazing and water resources under the primary jurisdiction of other groups, on which they rely in the dry season.[19]

29. In China, the National People's Congress passed the Law on Combating Desertification. The law sets out basic guidelines, responsibilities and obligations, a management system, guarantee measures and the legal consequence of violating the law.[20]

30. In several countries with economies in transition, new laws on land ownership provide new opportunities to address land degradation issues.[21]

31. Lack of access to markets, which constrains the ability of farmers to buy agricultural and farming inputs and sell their produce, remains a barrier to economic growth and sustainable livelihoods in many drylands. Past efforts to improve market access have often not worked because of a failure to deal in an integrated fashion with all of the elements that must come together: Government investment in infrastructure; incentives for the private sector to invest in agriculture and livestock

[17] Africa Review Report on Drought and Desertification (main report). Economic Commission for Africa, July 2007, pp. 33-34.

[18] United Nations Environment Programme, *Global Environment Outlook: Environment for Development (GEO 4)*, Valletta, 2007, p. 213.

[19] E/ECA/ACSD/5/9, pp. 9-10.

[20] China National Committee for the Implementation of the UNCCD (CCICCD), China National Report on the Implementation of the United Nations Convention to Combat Desertification, Beijing, June 2006.

[21] Draft report of the fifth session of the Committee for the Review of the Implementation of the United Nations Convention to Combat Desertification, held in Buenos Aires from 12 to 21 March 2007, p. 28 (ICCD/CRIC(5)/L.1).

production; and capacity-building for the users of markets. In addition, global trade regimes, in particular, agricultural subsidies and tariff barriers, are affecting the incomes and competitiveness of dryland producers in developing countries.

C. Conservation of dryland vegetation

32. The natural vegetation is critical to the economic and biological productivity of ecosystems upon which dryland people depend. Dryland vegetation is often fragile and more vulnerable to climatic variations and unsustainable human activities than non-dryland vegetation. Lower rainfall resulting from drought reduces soil moisture and vegetation cover and induces further degradation in the services dryland ecosystems provide. Local communities, especially poor families, are often compelled to seek their survival by overexploiting the ecosystems of drylands, such as overgrazing and massive conversion of forests and grasslands to arable lands, thereby further increasing areas affected by desertification.[22]

33. In many semi-arid drylands, a progressive shift from grassland to shrubland has taken place, encouraging increased runoff velocity and resulting in higher soil erosion rates.[23] This process, known as bush encroachment, has, for example, been observed in Africa, Australia and the western United States.[24]

34. Reduction of vegetation cover has increased the formation of dust leading to dust storms, which are widely considered to be a cause of ill health during dry seasons.

1. Rehabilitation of grasslands

35. In China, the system of grassland-contracted responsibility is being practised in most pastoral areas. On the basis of public ownership, grassland has been divided among households under contracted responsibility and household livestock-raising is being supported. From 2002 to 2005, the Government of China invested over Y8 billion in the restoration of natural grassland vegetation, pasturing seed plantation and converting grazing land to grassland. As a result, further deterioration of the vegetation cover could be contained and the productive capacity of the soil enhanced.[25]

36. The rehabilitation of bush and motley-grass ecosystems on degraded river plains and the improvement of the living standards of the local population are the twin objectives of the pilot project "Zhanartu" ("Renovation") being implemented by the "Zhangeldy" village community in Kazakhstan. Those objectives are being achieved by transferring the grazing of large numbers of livestock to pastures farther away from the village so as to decrease grazing pressure on the nearest pastures.

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[22] *Ecosystems and Human Well-being: Current State and Trends*, Millennium Ecosystem Assessment, 2005, World Resources Institute, Washington, D.C., chapter 22, "Dryland systems", p. 631.

[23] *Ecosystems and Human Well-being: Desertification Synthesis*. Millennium Ecosystem Assessment, 2005, World Resources Institute, Washington, D.C., p. 6.

[24] David Thomas, People, "Deserts and Drylands in the Developing World". Policy Briefs, Science and Development Network (SciDevNet), October 2006, p. 3.

[25] China National Committee for the Implementation of the UNCCD (CCICCD), China National Report on the Implementation of the United Nations Convention to Combat Desertification, Beijing, June 2006, p. 19.

The project has already achieved some results both in preventing soil erosion and restoring vegetation and in improving the living standards of the villagers. The increase in animal production has increased food security in the village. Moreover, some families are already able to offer the produce from their animals for sale at the market. At present, the activities carried out by village members are entirely self-financed.[26]

37. In Ethiopia, "area enclosure" has proved to be a particularly low-cost and effective approach to rehabilitation. It is a process by which eroded areas of land are protected from grazing for a period of years to allow for the natural regeneration of the original vegetation. Soil and water conservation measures, including terracing and the planting of trees and grasses, are increasingly used to assist the process. Community ownership of the process has been the key to its success. The communities draw up the laws and regulations on which piece of land is to be enclosed and protected, and when and how usage will again be permitted.[27]

38. Australia's experience suggests that the large-scale rehabilitation of degraded grassland resources requires addressing a combination of factors with an integrated approach. Overall, time frames are long and significant commitment is required to achieve long-term goals. The regeneration of the Ord River catchment, which was the largest and most ambitious undertaking of its kind in Australia and one of the few successful examples of such wide-scale rehabilitation, demonstrated the usefulness of taking an integrated and long-term approach.[28]

2. Forestation

39. Globally, the United Nations Convention to Combat Desertification estimated that more than 15 million hectares of tropical forests are depleted or burned every year in order to provide for small-scale agriculture or cattle ranching, or for use as fuel wood for heating and cooking.[29] Losses were greatest in Africa and in Latin America and the Caribbean.

40. Many developing countries undertook concrete initiatives in sustainable forest management, recognizing the important contributions that forests can make to combating desertification, land degradation and climate change. Afforestation, reforestation and forest protection schemes have been implemented to maximize the value of forest products and returns of investments in sustainable forest management. Some countries adopted new forest laws. Efforts are also being made to improve law enforcement. Some examples at the country level are provided in box III.

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[26] http://www.unccd.entico.com.

[27] http://www.unccd.int/publicinfo/localcommunities/ethiopia.

[28] Paul Novelly and I. Watson, "Successful grassland regeneration in a severely degraded catchment: A whole of Government approach in North-West Australia". Case study presented to the International Workshop on Climate and Land Degradation, Arusha, 11-15 December 2006 (abstract).

[29] "The United Nations Convention to Combat Desertification (UNCCD): a carrying pillar in the global combat against land degradation and food insecurity". Background paper for the San Rossore meeting, "Climate change: a new global vision", Pisa, Italy, 15-16 July 2004.

Box III
Sustainable forest management: some country examples

Burundi's new Forest Code treats forests as a common good that must be protected and only be exploited if due attention is paid to the impact on the environment. Protecting forests is also seen as a means to reduce poverty and prevent migration, as forest-related activities offer income-generating opportunities.

The reforestation programmes applied in Cape Verde from 1974 to 2004 managed to afforest some 90,000 hectares, of which approximately 5,000 were afforested from 2002 to 2004 alone.

Indonesia has undertaken serious reforestation efforts to rehabilitate degraded land, through, among other things, the National Forest and Land Rehabilitation Programme and the National Movement on Forest and Land Rehabilitation launched in 2003.

The cornerstone of Malaysia's National Forest Policy is the establishment of permanent reserved forests to ensure sustainable management of about 4.8 million hectares of forested land that has been designated as permanent reserved forest. It is an area that comprises 36.8 per cent of Malaysia's total land area.

Since 1998, farmers in Brazil have had to maintain 80 per cent of their land as forest (50 per cent in some special areas) as a legal forest reserve. Small-scale forest management enables smallholders to make economic use of their forest reserves.

Sources: *Implementing the United Nations Convention to Combat Desertification in Africa: Ten African Experiences*, United Nations Convention to Combat Desertification, Bonn, Germany, 2006; Yang Youlin and Lu Qui, "Challenges and Priority Areas to Implement the United Nations Convention to Combat Desertification in South-East Asian countries". Asia Regional Coordination Unit of the United Nations Convention to Combat Desertification secretariat/United Nations Economic and Social Commission for Asia and the Pacific/China National Research and Development Centre for Combating Desertification, Chinese Academy of Forestry; United Nations Environment Programme, *Global Environment Outlook: Environment for Development (GEO 4)*, Valletta, 2007.

41. The Operation Acacia project, launched in 2003 and implemented by FAO with financial support from the Government of Italy, has helped local farmers to restore degraded land by planting Acacias that produce gums and resins — important products for Sahelian people's livelihoods. Participating countries are Burkina Faso, Chad, Kenya, the Niger, Senegal and the Sudan. The project has trained about 56,000 producers of gum arabic and resin on ways to improve their production in order to meet international market standards. As a result, more than 13,000 hectares of degraded land have been restored. This has improved animal feeding and reduced conflicts between farmers and pastoralists. The sale of gum and

resin overseas has brought in much needed cash to the region and helped the farmers diversify and increase their sources of income. [30]

42. According to FAO experience gained with the implementation of forest projects in desertification-affected countries in Africa, forestation was found successful when the following conditions were jointly applied:

- Local people were involved all along the process, from the conception to the management of the new resources
- Large monospecific tree stands were avoided and, instead, a patchwork of different vegetation cover types was implemented, with crop and tree species selected by the beneficiary populations
- Locally adapted species, especially in regard to water availability and water demand, were considered
- Restored land and vegetative cover were protected from the causes of their degradation, mostly the harvesting of fuel wood, grazing and fires.

3. Natural regeneration

43. Most recent research studies indicate a significant greening of parts of the African Sahel during the 1990s, comprising, in particular, parts of Senegal, Mali, Chad, the Niger and the central plateau of Burkina Faso.

44. Some studies found that the increase in vegetation cover can be explained by increased rainfall in some regions of the Sahel, but not in others. Improved land management, such as increased investments in soil and water conservation, together with the application of improved soil and water conservation techniques, and the expansion of irrigation may have played a part. In addition to improved land management, other factors, such as reduced area under cultivation as a result of high rural-urban migration, might also have contributed to the observed trend of increased vegetation in the Sahel.[31]

45. According to the 2005 Millennium Ecosystem Assessment *Desertification Synthesis* report, long-term remote sensing studies indicate extensive recovery of vegetation productivity in many parts of the Sahel region after the droughts, suggesting that it was almost completely controlled by rainfall.[32] This confirms the findings of other studies, which argue that changes in vegetation cover, at least on a regional scale, appear to be primarily driven by climatic variability, suggesting that

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[30] Food and Agriculture Organization of the United Nations, "Killing two birds with one stone: transferring knowledge to fight poverty and land degradation" (http://www.fao.org/forestry/newsroom/en/news); "Operation Acacia: boosting production of gums and natural resins" (http://www.fao.org/english/newsroom/news).

[31] Stefanie M. Herrman, Assaf Anyamba and Compton J. Tucker, "Recent trends in vegetation dynamics in the African Sahel and their relationship to climate". Global Environmental Change Part A, vol. 15, issue 4, December 2005, pp. 394-404; L. Olsson, L. Eklundh and J. Ardo, "A recent greening of the Sahel: trends, patterns and potential causes". *Journal of Arid Environments 63* (2005), pp. 556-566.

[32] *Ecosystems and Human Well-being: Desertification Synthesis*. Millennium Ecosystem Assessment, 2005, World Resources Institute, Washington, D.C., p. 20.

vegetation can quickly recolonize areas that have apparently experienced desertification, when rainfall permits.[33]

D. Maintaining freshwater bodies and groundwater resources

46. Inefficient water use in irrigated agriculture, land degradation and exposure to drought have increased the pressure on freshwater bodies and groundwater resources in many dry lands. As water tables fall, salinity increases and water quality declines, with associated negative impacts on human and animal health, soil productivity and biodiversity.

47. The Kalahari basin of southern Africa, for example, is experiencing falling water tables because of increased sedentary livestock production. Research indicates that water is being recharged at no more than 1 millimetre per annum in the centre of the basin, while extraction has lowered the water table over a meter in some places in recent years.[34] In remote parts of Mongolia, where nomadic pastoralism is persisting, pumped wells are collapsing, restricting livestock movements and increasing the pressure on seasonal rivers.[35]

48. Agriculture in the countries of West Asia's Gulf Cooperation Council contributes less than 2 per cent to gross domestic product in Council countries, but it overexploits groundwater resources, most of which are non-renewable, resulting in their depletion and quality deterioration owing to seawater intrusion and the up-flow of saltwater.[36]

49. A series of protective measures have been implemented in watersheds in countries of northern Africa to make better use of investments in water-control structures. The application of newer technologies and practices for improved fallow periods, microbasins and windbreaks has gained momentum in light of participatory approaches to soil conservation.[37]

50. Regulating water pumping can help re-establish groundwater resources, as successfully proven at the Azraq oasis in Jordan. Despite years of groundwater decline, the oasis was restored after a Government and Global Environment Facility project started regulating pumping.[38] In part of northern China, where groundwater resources have been overexploited, the water exploitation has been restricted and water recharge measures have been taken.

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[33] Nick Brooks, "Drought in the African Sahel: Long-Term Perspectives and Future Prospects". Tyndall Centre for Climate Change Research, University of East Anglia, Norwich, United Kingdom, Working Paper, No. 61, October 2004, p. 11; Charney, J., Quirk, W. J., Chow, S. H. and Kornfield, J., "A Comparative Study of the Effects of Albedo Change on Drought in Semi-Arid Regions". In: *Journal of the Atmospheric Sciences*, vol. 34, issue 9, American Meteorological Society, Boston, United States of America, 1977, pp. 1366-1385.

[34] D. S. G. Thomas, The Environmental Impact of Groundwater Exploitation in African Grasslands. Proceedings of the Dubai 2002 International Conference on Integrated Management of Water Resources in the Third Millennium, Balkema, Rotterdam, 2002.

[35] David Thomas, People, Deserts and Drylands in the Developing World. Policy Briefs, Science and Development Network (SciDevNet), October 2006, p. 5.

[36] United Nations Environment Programme, *Global Environment Outlook: Environment for Development* (GEO 4), Valletta, Malta, 2007, p. 267.

[37] *Global Deserts Outlook*, *GEO Year Book 2006* (executive summary), UNEP (Nairobi, 2006).

[38] Theib Oweis, "Improving access to water in deserts and dry lands". Policy Briefs, Science and Development Network (SciDevNet), October 2006, p. 2.

51. In an attempt to promote the sharing of water resources in Africa, the African Water Facility and the Sahara and Sahel Observatory recently signed a grant agreement worth €487,800 to finance the joint GEO-AQUIFER Knowledge Improvement and Northern Sahara Aquifer System Project. The project intends to promote concerted actions among Algeria, the Libyan Arab Jamahiriya and Tunisia, which share the Northern Sahara Aquifer System, and capacity-building in the three countries to enable efficient management of the shared water resource.[39]

E. Means of implementation

1. Finance

52. Though national budgetary allocations to combat desertification and mitigate the effects of drought have increased in some of the affected countries, many other countries have not been able to secure the needed financial resources. The 2007 Africa Review Report on Drought and Desertification noted that the lack of financial resources remains one of the most pressing constraints to implementation of desertification control plans in most of the countries in the African region.

53. Efforts to attract private sector investments in sectors relevant to desertification and drought often failed owing to the lack of financial incentives that could help to secure profitable investment returns. Poverty and inadequate access to affordable credit facilities prevented local people from acquiring funding that they could profitably invest in measures to prevent land degradation and sustain their livelihoods.

54. Some countries have set up National Desertification Funds as part of the National Action Programme process, which serve as local and easily accessible sources of funding for the implementation of Programme priorities. Some country examples with regard to securing funds for combating desertification are provided in box IV.

Box IV
Securing funds for combating desertification: some country examples

In 2004, Kenya established the Desertification Community Trust Fund with a Board of Trustees, with representation from the public and private sectors and from civil society. The Fund has benefited from significant contributions from the private sector. Its objectives are to facilitate research on desertification, enhance environmental management and capacity-building, raise public awareness and provide grants for sustainable environmental management.

In 2003, Morocco, with the support of the Global Mechanism of the United Nations Convention to Combat Desertification, devised a strategy to overcome the constraints facing the country in securing adequate funding for combating desertification. The strategy provides the framework for: (a) identifying priority programmes and projects on

[39] "Mobilizing Resources for Water in Africa", African Development Bank, January 2007 (press release).

desertification through a consultative process; (b) identifying sources of finance to support the implementation of those programmes and projects; and (c) creating compatibilities between the selected priority programmes and projects and external funding opportunities.[40]

The Government of Indonesia has mobilized and provided funds for reforestation and land rehabilitation measures. Efforts are coordinated by the Ministry of Finance and the Ministry of Forestry. Sources of these funds were national and local budgets and the National Reforestation Fund.

Sources: *Implementing the United Nations Convention to Combat Desertification in Africa: Ten African Experiences*, United Nations Convention to Combat Desertification, Bonn, Germany, 2006, pp. 19, 24 and 25; Yang Youlin and Lu Qui, "Challenges and Priority Areas to Implement the United Nations Convention to Combat Desertification and National Action Programme to Combat Desertification in South-East Asian Countries", p. 12.

55. There seems to be a growing awareness concerning markets and payments for ecosystem services. The 2006 Meeting of the East and Southern Africa Katoomba Group, for example, reported that countries in Africa have become increasingly interested in market-based conservation strategies, such as payment for ecosystem services, and a number of projects are under way.[41] Similarly, the report of the fifth session of the Committee for the Review of the Implementation of the United Nations Convention to Combat Desertification (CRIC-5), held in Buenos Aires in March 2007, noted that progress has been achieved in obtaining commitments from Governments to earmark budgetary allocations, rural credit or payment for ecosystem services.

56. For many countries, internationally funded projects are an important catalyst to implement their National Action Programmes established under the Convention. External financial assistance, however, is generally considered not to be commensurate with the financial needs of developing countries to combat desertification. The report of CRIC-3, for example, noted that financial assistance by development agencies often does not link up with National Action Programme priorities and that funding has rarely been channelled to the national desertification funds which some countries have established.[42]

57. The Global Environment Facility, through its implementing agencies (UNEP, the United Nations Development Programme and the World Bank), is providing support for programmes and activities to combat desertification and mitigate the effects of drought. The 2007 Africa Review Report on Drought and Desertification estimated that, from 2002 to 2004, the Facility funded more than $72 million worth

[40] Implementing the United Nations Convention to Combat Desertification in Africa: Ten African Experiences, United Nations Convention to Combat Desertification, Bonn, 2006, pp. 24 and 25.

[41] Catalizing Payments for Ecosystem Services in Africa: A Meeting of the East and Southern Africa Katoomba Group, Cape Town, South Africa, 8-10 November 2006 (conference overview).

[42] Committee for the Review of the Implementation of the United Nations Convention to Combat Desertification, Report of the Committee on its third session, held in Bonn, Germany, from 2-11 May 2005, pp. 8/9 (ICCD/CRIC(3)/9).

of projects focused primarily on combating deforestation and desertification globally.[43]

58. The United Nations Convention to Combat Desertification Global Mechanism is carrying out a number of programmes at the national and subregional levels to mobilize financial resources for Convention implementation. Lead agencies and countries have been designated under the Convention to facilitate the mobilization of financial and technical support in combating desertification.

2. Technology and traditional knowledge

59. Improved water and soil conservation technologies, new technologies to grow climate-resilient crops and other technologies that have the potential to enhance land productivity and increase agricultural production are available. Often, however, farmers are not aware of the potential of available technologies. Experience has shown that the knowledge of the actual gains that can be achieved with technology application, on a stable and long-term basis, is essential to the willingness of potential technology users to invest in new technologies and techniques.

60. Equally important is the capacity to use the technology in the most efficient manner. In Burkina Faso, Mali and the Niger, dry-land farmers have adopted, through an FAO project, the "microdose" technology that involves a rate of fertilizer application, which is only one third of the recommended rates for the areas. In all cases where "microdosing" fertilization was used, grain yields of millet and sorghum were reported to have increased 43 to 120 per cent.

61. Building on traditional knowledge has proven to be an effective way of self-help in dealing with the problems associated with desertification at the local and household levels, as it uses assets over which farming communities retain direct control. In Senegal and Burkina Faso, for example, rural farmers are successfully using traditional pruning and fertilizing techniques to double tree densities in semi-arid areas in order to hold soils together and reverse desertification. Similar community-initiated projects in Madagascar and Zimbabwe have been acclaimed successes.[44]

62. In Ethiopia, utilization of indigenous knowledge systems for land and natural resource management, such as in situ conservation of crop varieties, indigenous terrace building and application of an agroforestry system, have resulted in the reduction of the rate of genetic erosion and the restoration of the local seeds or landraces in regions where they were wiped out by severe drought, control of land degradation in some areas and improved biodiversity conservation in others.[45]

3. Information and capacity-building

63. The complexity of interactions between regional and local biophysical conditions and human interventions makes it difficult to determine the cause-and-effect of desertification correctly and to determine appropriate and timely responses.

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[43] Africa Review Report on Drought and Desertification (main report). Economic Commission for Africa, July 2007, pp. 33 and 34 (ECA/FSSD/ACSD-5/3).

[44] Economic Commission for Africa, State of Environment in Africa, Addis Ababa, 2006, p. 9 (ECA/FSSDD/01/06).

[45] Africa Review Report on Drought and Desertification (main report). Economic Commission for Africa, July 2007, p. 23 (ECA/FSSD/ACSD-5/3).

The use of remote sensing technology allows for better monitoring and mapping of desertification processes, thereby facilitating greater diagnostic analysis and potential identification of trends.

64. The establishment of information systems, inventories of desertification-affected or desertification-prone areas, centralized land-use information complemented by quantitative and qualitative analysis, and on-site and remote-control monitoring systems have been included as priorities in several National Action Programmes on desertification.[46]

65. Some African countries have established desertification information systems as part of the National Action Programme process to assist in monitoring interventions in order to combat desertification and mitigate drought impacts. A long-term ecological monitoring and observatory network has been established in the Sahel subregion and has facilitated observatories in 11 countries to gather information on the evolution of natural resources and the effectiveness of management systems.

66. In China, the National Natural Resources Committee approved and funded a research project entitled "Desertification Occurrence Mechanism and Optimistic Model for Combating Desertification", which includes the topic of "indicators system of desertification classification and expert system".[47]

67. The UNEP/FAO Land Degradation Assessment in Dry Lands systematically observes land degradation to increase understanding of drought and desertification processes and their effects. A new, quantitative global assessment under the Assessment identifies black spots of land degradation by trends analysis of the last 25 years' net primary productivity (NPP or biomass production). NPP is derived from satellite measurements of the normalized difference vegetation index (NDVI or greenness index).[48]

68. Capacity-building of local communities to reinforce their control over resources and their products and empower them to get fair access to resources is at the core of the work of FAO with countries and partners in combating desertification. Increasing recognition is being given to the value of ecosystem-based approaches that address the interactions among components in the land use system and take due account of the biophysical, socio-economic and policy context. Traditional knowledge and experience is built on by promoting farmer innovations and experimentation, combined with technical advice that draws from the latest research and scientific development.

69. The FAO Farmer Field School Approach for integrated soil management, which follows the principles of people-centred learning and is based on experience in Africa, has been developed as an alternative to the conventional top-down test and verification extension approach. It uses innovative and participatory methods to

[46] Committee for the Review of the Implementation of the United Nations Convention to Combat Desertification, Report of the Committee on its fifth session, held in Buenos Aires from 12 to 21 March 2007, p. 30 (ICCD/CRIC(5)/L.1).

[47] China National Committee for the Implementation of the UNCCD (CCICCD), China National Report on the Implementation of the United Nation Convention to Combat Desertification, Beijing, June 2006.

[48] United Nations Environment Programme, *Global Environmental Outlook: Environment for Development (GEO 4)*, Valletta, 2007, p. 124.

create a learning environment, where land users have the opportunity to learn from each others' experience in areas such as crop production, soil and water conservation, water harvesting and irrigation.

4. National action programmes

70. Action programmes on desertification are considered key instruments in the implementation of the Convention. Currently, about 80 countries have drawn up a National Action Programme, and some other countries are in various stages of preparing one. National Action Programmes have been supplemented by regional and subregional action programmes developed through consultations among the countries of the respective region or subregion.

71. There is a notable trend towards achieving better coherence among programmes to combat desertification and national development plans and poverty reduction strategies. The 2006 China National Report on the Implementation of the Convention, for example, noted that the strategic objectives of combating desertification have been incorporated into the National Economic Development Plan. Burundi, Kenya, Tunisia, Burkina Faso and Uganda are among the countries that have succeeded in mainstreaming National Action Programmes into national development plans and poverty reduction strategies. In many other countries, however, mainstreaming the Programmes into national development frameworks is often constrained by the lack of capacity in areas such as integrated planning, cross-sector coordination and information and knowledge management.

72. Given that desertification reaches across many development sectors, intersectoral cooperation has been encouraged in the preparation of National Action Programmes. In Africa, some countries are establishing National Coordinating Bodies to facilitate cross-sectoral and integrated planning of desertification control programmes.

73. The Government of China established the National Committee for the Implementation of the United Nations Convention to Combat Desertification (CCICCD), which is composed of 17 ministries and State commissions. The secretariat of CCICCD is responsible for guiding, coordinating and supervising the actions being undertaken to combat desertification. In addition, the Government has set up National Coordinating Groups in the affected provinces to ensure effective management in the implementation of actions between the central and local levels.[49]

74. As reported in various national reports on the implementation of the Convention, the National Action Programme process has contributed to the capacity-building of participating stakeholders at the national and local levels, empowering them to deal with drought and desertification more effectively. The participatory approach used in the process has encouraged the mobilization of resources and enabled central, State and local governmental authorities to better coordinate actions and allocate resources where they are needed most. In some cases, it has triggered institutional and legislative reforms supportive of effective policies and measures to combat desertification and mitigate the effects of drought.

[49] China National Committee for the Implementation of the UNCCD (CCICCD), China National Report on the Implementation of the United Nations Convention to Combat Desertification, Beijing, June 2006.

75. Most African countries, for example, have organized national awareness-raising seminars in order to launch the process of formulating their National Action Programmes. In the Niger, the National Environmental Council for Sustainable Development launched a capacity-building project to enable more coordinated consultations with non-governmental organizations that are engaged in the fight against desertification. Recognizing the high strategic importance of coordinating the various players actively involved in the fight against desertification, Tunisia created a National Committee for Combating Desertification, which was upgraded in 2005 to a National Council for Combating Desertification.[50]

76. Limited progress, however, has been noted with regard to National Action Programme implementation. With respect to Africa, a 2005 analysis prepared by the secretariat of the Convention stated: "while most of the countries of the region have had national action programmes for several years, meaningful progress has not been made with their operational implementation".[51] The 2007 Economic Commission for Africa Africa Review Report on Drought and Desertification noted that several African country reports identified capacity and resources constraints as well as the lack of integration of desertification control programmes into planning and budgetary frameworks at various levels, among the main impediments to Programme implementation.

III. Continuing challenges

77. The level of rural poverty in many developing countries affected by desertification and drought, which is particularly high in the African region, continues to be the overarching challenge in the fight against desertification and the most serious constraint to progress in combating desertification and mitigating the impact of drought.

78. Changing to more sustainable practices and methods in agricultural and pastoral land use remains a major challenge to achieving long-term progress in the fight against land degradation and desertification.

79. The projected intensification of freshwater scarcity will cause greater stresses in dry lands. If left unmitigated, such stresses will further exacerbate desertification.

80. Weak institutional and legal structures and capacities, poor coordination and collaboration among stakeholders involved in combating desertification and poor enforcement of legislation to guarantee clear legal ownership and access rights to land, water and other natural resources continue to hamper the implementation of focused and effective interventions.

81. Insecure land tenure and lack of access to markets are among the main barriers to the willingness of land users to invest in long-term sustainable land management. When farmers and herders lose control or long-term security over the land they use, the incentives for maintaining and improving land productivity are lost since they would in all likelihood not be able to reap the future rewards of such investments. Similarly, if farmers lack the opportunity to sell their agricultural products on the

[50] Implementing the United Nations Convention to Combat Desertification in Africa: Ten African Experiences, United Nations Convention to Combat Desertification, Bonn, 2006, pp. 22 and 36.

[51] ICCD/CRIC(3)/2/Add.1, para. 13.

market, they have little to gain by investing in more sustainable and output-increasing agricultural practices.

82. Although the integration of priorities identified in the national action plans to combat desertification into national development and budgeting frameworks has been recognized as important for resource allocation, fostering political commitment and mobilizing bilateral and multilateral financial and technical assistance, the actual process of integration remains slow in many countries, hampering speedy and effective implementation of anti-desertification interventions.

83. In the campaign against desertification and land degradation in many affected developing countries, difficulties continue to be faced in mobilizing needed large and long-term investments from central and local government budgets alone. Providing economic and non-economic incentives to other national stakeholders to encourage investments in the sustainable management of land, forests and other ecosystems can play a critical role in the mobilization of needed financial resources.

84. Many affected developing countries are lacking the scientific and technological means for effectively dealing with desertification and land degradation. Dissemination of appropriate new and emerging technologies from laboratories to field application in those countries, with assistance from development partners, remains a challenge.

85. There are still major knowledge gaps existing, for example, with regard to understanding the interactions between biophysical, human and climatic factors and their impacts on desertification processes and in using holistic approaches to combat desertification and foster the sustainable development of dry lands. There are also scientific challenges in detecting thresholds beyond which the changes to dry-land systems would be irreversible.[52]

86. The monitoring of desertification trends and the assessment of their socio-economic causes and impacts, which is considered central to the identification of focused interventions, is often hampered by the inadequate institutional and technical capacities of information and climate observation systems to access and analyse remote sensing material and to disseminate accurate and user-relevant data and information in a timely fashion.

87. Strengthening support by the international community remains crucial for implementing action programmes to combat desertification and land degradation in affected developing countries. The 10-year strategic plan and framework adopted by the Conference of the Parties to the United Nations Convention to Combat Desertification at its eighth session has strengthened the commitment of the international community to combat desertification, mitigate the effects of drought and combat climate change. The Convention offers a platform for adaptation, mitigation and resilience.

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[52] Discussion papers of major groups submitted to the Commission on Sustainable Development at its sixteenth session: contribution by the scientific and technological community (E/CN.17/2008/13/Add.8).